

6,021,770

5

such as rubber. First and second mounting elastomer 260 and 290 are formed of in-situ cast silicone. Thus mounting shaft 200 is embedded in the annular form of vibration damping elastomer 280. Vibration damping elastomer 280 may be formed of any elastomer, but preferably of a vibration-damping viscoelastic polymer material. The viscoelastic polymer material selected for vibration damping elastomer 280 preferably has a compression set of less than 15%, an elongation at break of at least 500%, and a recovery after compression which is delayed by at least 0.7 seconds. A suitable viscoelastic polymer material is a flexible thermoset polyether based polyurethane of essentially linear structure containing unsatisfied hydroxyl groups. An especially suitable viscoelastic polymer material is the polyurethane "Sorbothane" available from Sorbothane Inc. of Kent, Ohio. The viscoelastic polymer "Sorbothane" is described in U.S. Pat. Nos. 4,101,704, 4,346,205, and 4,777,739 to Hiles, the entire disclosure of each of which is hereby incorporated by reference. The durometer specification of vibration damping elastomer 280 should preferably be about 25 to 80, and most preferably about 50 (Shore 00 scale). The high damping performance of the preferred viscoelastic polymer material reduces the impulse peak of a shock wave over a longer time period than with the use of materials such as butyl or neoprene. Low amplification of vibrations at resonance is also a desirable characteristic of vibration damping elastomer 280 for use in the stabilizer, and this characteristic is also provided by the preferred "Sorbothane" material.

It is important that vibration damping elastomer 280 and all the internal elements of the stabilizer be disposed to avoid any metal-to-metal contact in the structure and in the use of the bow stabilizer. Mounting shaft 200 is embedded in at least a portion of the annular form of vibration damping elastomer 280. Thus vibration damping elastomer 280 should surround that portion of mounting shaft 200 that extends inside cylindrical body 30, and mounting shaft 200 should not extend far enough into cylindrical body 30 to make contact with cap end 40 or any other non-elastomeric element that could transmit undamped vibration between mounting shaft 200 and cylindrical body 30 or cap end 40.

Lock-nut 310 is covered by a nut cover 320, which may be formed of a rigid foam. Line-retaining cap 100 has an outer surface 145, an inner surface 140, a line exit orifice 110, and a threaded ring 150. Line exit orifice 110 of line-retaining cap 100 has an outer tapered surface 120 and inner tapered surface 130 communicating with bore 135. Inner and outer surfaces 120 and 130 and bore 135 are concentric with the longitudinal axis of body 30. Outer tapered surface 120 extends from bore 135 to outer surface 145 with the line exit orifice wider at surface 145 than at bore 135. Inner tapered surface 130 extends from bore 135 to inner surface 140 with the line exit orifice wider at surface 140 than at bore 135.

Line 165 is wound on a spool 160 contained in a cavity 170 formed by inner wall 70 of body 30, inner wall 140 of line-retaining cap 100 and surface 325 of nut cover 320. Line 165 preferably constitutes 14 lb. to 20 lb. test nylon line, with 17 lb. test being typical.

Of course the stabilizer may be used without using the game-tracking feature, and versions may be made without a cavity 170 and line orifice 110 for applications in which the game tracking feature is not needed. Versions without the game-tracking feature may be made shorter, omitting the parts not needed, such as cavity 170 and line orifice 110. Such versions are useful for target archery, for example, or for hunting when a very short stabilizer is desired.

INDUSTRIAL APPLICABILITY

The applications of the invention include both target and hunting archery. The invention provides an apparatus for

6

stabilizing the balance and reducing torque of a bow for more accurate shooting and for finding arrows that miss their intended target as well as leading the hunter to game that has been hit. This provides cost saving in terms of arrows, conserves game, and improves the archer's enjoyment of the sport.

The description of the embodiments of the present invention is given above for the understanding of the present invention. It will be understood that the invention is not limited to the particular embodiments described herein, but is capable of various modifications, rearrangements, and substitutions without departing from the scope of the invention. For example, the distribution of mass along the longitudinal axis of the bow stabilizer and game tracker may be varied to vary the system's natural frequency and to vary its moment of inertia about an axis through or near the mounting point. Therefore it is intended that the following claims cover all such modifications and changes as fall within the true spirit and scope of the invention.

Having described my invention, I claim:

1. An archery bow stabilizer comprising:

a hollow body having a longitudinal axis, a first end and a second end;

means for absorbing shock and damping vibration contained within said hollow body adjacent to said first end of said hollow body; and

an attachment element for connecting said shock and vibration damping means to said archery bow, said attachment element including means for attaching said element to said archery bow at a first end and means for attaching said attachment element only to said means for absorbing shock and damping vibration at a second end.

wherein said means for absorbing shock and damping vibration comprises an annular viscoelastic elastomer disposed between said hollow body and said attachment element, said annular viscoelastic elastomer surrounding said attachment element, for preventing transmission of undamped vibrations between said hollow body and said attachment element.

2. An archery bow stabilizer as in claim 1 wherein said elastomer comprises a viscoelastic elastomer having a compression set of less than 15%, an elongation at break of at least 500%, and a recovery after compression which is delayed by at least 0.7 seconds.

3. An archery bow stabilizer as in claim 1 wherein said elastomer comprises a flexible viscoelastic polyurethane of essentially linear structure containing unsatisfied hydroxyl groups.

4. A combination archery bow stabilizer and game tracking device comprising:

a hollow body having a longitudinal axis, a first end and a second opposite end;

means for absorbing shock and damping vibration contained within said hollow body in said first end of said hollow body;

an attachment element for connecting said shock and vibration damping means to said archery bow, said attachment element including means for attaching said element to said archery bow at a first end and means for attaching said attachment element only to said means for absorbing shock and damping vibration at a second end, said means for absorbing shock and damping vibration comprises an annular viscoelastic elastomer disposed between said hollow body and said attach-

6,021,770

7

ment element, said annular viscoelastic elastomer surrounding said attachment element;

a chamber in said second end of said hollow body for storing a spool of tracking line; and

means for retaining said spool of tracking line while allowing said tracking to pay out.

5. A combination archery bow stabilizer and game tracking device as in claim 4 wherein said means for absorbing shock and damping vibration comprises a viscoelastic elastomer.

6. A combination archery bow stabilizer and game tracking device as in claim 5, wherein said viscoelastic elastomer has a compression set of less than 15%, an elongation at break of at least 500%, and a recovery after compression which is delayed by at least 0.7 seconds.

7. A combination archery bow stabilizer and game tracking device as in claim 5, wherein said viscoelastic elastomer comprises a flexible polyurethane of essentially linear structure containing unsatisfied hydroxyl groups.

8. A combination archery bow stabilizer and game tracking device as in claim 4 wherein said attachment element is rotatable through a 360 degree angle about said longitudinal axis of said hollow body.

9. A combination archery bow stabilizer and game tracking device as in claim 4 wherein said attachment element comprises a rod and said means for attaching said attachment element to said means for absorbing shock and damping vibration comprises embedding at least said second end of said rod in said viscoelastic elastomer.

10. A combination archery bow stabilizer and game tracking device as in claim 4 wherein said means for both retaining said spool of tracking line comprises a removable cap having a orifice concentric with said longitudinal axis through which said tracking line is free to pass.

11. A combination archery bow stabilizer and game tracking device as in claim 4 wherein said hollow body is fabricated from a material selected from the group consisting of steel, copper, brass, aluminum, and plastic.

12. A combination archery bow stabilizer and game tracking device comprising:

a hollow cylindrical body having a longitudinal axis, a first end and a second opposite end, an inner surface and an outer surface;

an annular cylinder of viscoelastic elastomer aligned with said longitudinal axis of said hollow body near said first end of said hollow body, said annular cylinder having a central bore;

a rod having a first threaded end for attaching to said archery bow, a middle portion and a second threaded end extending through said central bore of said annular cylinder.

said elastomer being contained within said hollow body and held in compression by a retaining ring in said first end of said hollow body and by a lock-nut on said second end of said rod and said first end of rod extending beyond said first end of said body; and

a chamber for storing a spool of tracking line, said chamber being defined by said inner wall of said hollow body and a cap mounted in said second end of said hollow body.

said cap being detachably mounted to said second end of said hollow body for retaining said spool of tracking

8

line, said cap having a orifice with a central bore concentric with said longitudinal axis of said hollow body for allowing said tracking line to pay out.

13. A combination archery bow stabilizer and game tracking device as in claim 12, wherein said viscoelastic elastomer has a compression set of less than 15%, an elongation at break of at least 500%, and a recovery after compression which is delayed by at least 0.7 seconds.

14. A combination archery bow stabilizer and game tracking device as in claim 12, wherein said viscoelastic elastomer comprises a flexible polyurethane of essentially linear structure containing unsatisfied hydroxyl groups.

15. A combination archery bow stabilizer and game tracking device as in claim 12, further comprising a first rubber washer between said retaining ring and said elastomer and a second rubber washer between said lock washer and said elastomer.

16. A combination archery bow stabilizer and game tracking device as in claim 15, further comprising a first silicone rubber seal between said retaining ring and said first rubber washer and a second silicone rubber seal between said elastomer and said second lock washer.

17. A combination archery bow stabilizer and game tracking device as in claim 12, wherein said cap further comprises a inner surface and an outer surface, and said orifice further comprises a first conical surface extending angularly outward from said bore to said outer surface of said cap and a second conical surface extending angularly outward from said bore to said inner surface of said cap.

18. A combination archery bow stabilizer and game tracking device as in claim 12, wherein said hollow body and said cap are fabricated of a material selected from the group consisting of steel, copper, brass, aluminum, and plastic.

19. An archery bow stabilizer comprising:

a) mounting means for attachment to the bow;

b) a rod affixed to said mounting means and extending forward from said mounting means, said rod having an outer surface;

c) a cylindrical mass disposed around and spaced apart from said rod, said cylindrical mass having an interior surface; and

d) an energy-dissipative medium comprising a viscoelastic elastomer disposed between said rod and said cylindrical mass, said energy-dissipative medium extending radially from said rod to said interior surface of said cylindrical mass for damping vibration and for quieting sound resulting from vibration.

20. An archery bow stabilizer as in claim 19, wherein said cylindrical mass has front and rear ends, said rear end being open toward said mounting means and said front end being closed.

21. An archery bow stabilizer as in claim 19, wherein said energy-dissipative medium consists of a viscoelastic elastomer comprising a flexible polyurethane of essentially linear structure containing unsatisfied hydroxyl groups, said energy-dissipative medium having a compression set of less than 15%, an elongation at break of at least 500%, and a recovery after compression which is delayed by at least 0.7 seconds.

Add
BLS